Pink Hibiscus Mealybug Biological Control in Imperial Valley, California, 2002 Update

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The pink hibiscus mealybug (PHM), *Maconellicoccus hirsutus* (Green), was first detected in Imperial Valley, during August 1999. Population densities of PHM on mulberry, carob, silk oak, hibiscus and natal plum were determined to be high in several urban communities in southern Imperial Valley (Figure 1). Two parasitoid species, *Anagyrus kamali* Moursi and *Gyranusoidea indica* Shafee, Alam and Agarwal, were released at 10 sites in the fall of 1999. Subsequently, an insectary was established in El Centro for additional parasitoid production. The two species were then produced locally and released beginning in 2000. The culture of *A. kamali* produced up through 2001, originated from collections in China and Hawaii that were combined. *G. indica* was a combination of populations from Egypt, Pakistan, and Australia.

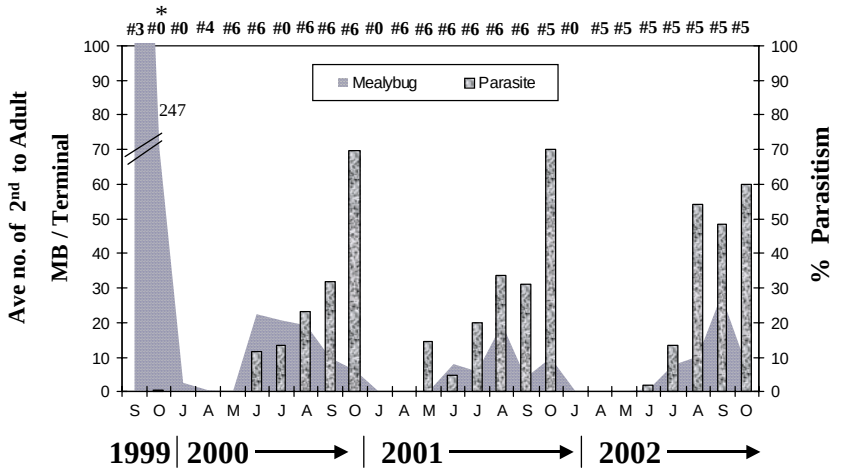
Production and Release: In 2002, a new culture of *A. kamali* was started. This population was collected in the very warm and dry climate of Upper Egypt, by Dr. Dan Gonzalez (UC, Riverside) in 2001. We produced and released approximately 213,000 *A. kamali* in 2002 (Table 1). Parasitoids were either released in Imperial Valley and provided to Mexican authorities for release in Mexicali Valley or sent to state and federal authorities in Florida for release against the recent PHM infestation in that state. In terminating the culture of *G. indica*, a final release of 13,800 parasitoids was made in California during January 2002.

Table 1. Destinations of PHM Parasitoids Produced at the California Department of Food and Agriculture Insectary, El Centro, CA in 2002

	Imperial Valley, California		Mexicali Valley, Mexico	Florida	Total
Month	**A. kamali***	**G. indica**	**A. kamali**	**A. kamali**	
January	1,200	13,800			15,000
February	3,100				3,100
March	9,050				9,050
April	10,150				10,150
May	9,100		3,500		12,600
June	0		12,400		12,400
July	1,850		15,250	9,600	26,700
August	2,650		7,100	12,000	21,750
September	34,500			12,000	46,500
October	26,250			9,600	35,850
November				9,600	9,600
December				10,800	10,800
Total	**97,850**	**13,800**	**38,250**	**63,600**	**213,500**

*From February 2002 onward, *A. kamali* culture was from Egypt, prior to that time it represented a combined culture of collections from China and Hawaii.

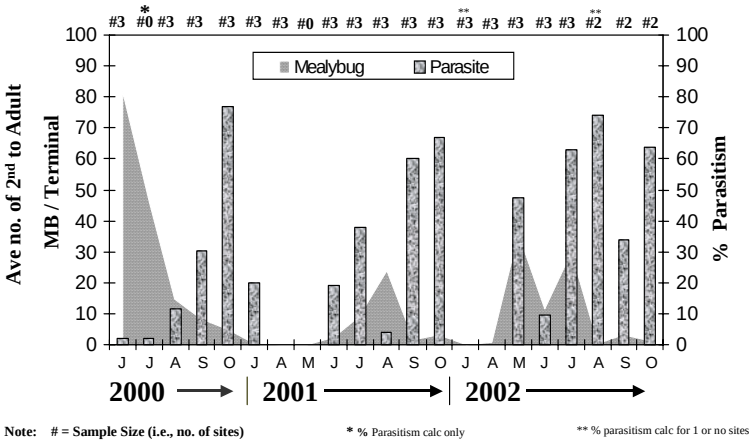
Figure 1. Pink Hibiscus Mealybug on Mulberry
Imperial Valley, California



Note: # = Sample Size (i.e., no. of sites) Mulberry terminal samples not available in January *** %** Parasitism calc only

Population monitoring: We continued PHM population density and parasitism monitoring on mulberry and carob trees at the same sites selected at the inception of the PHM project. Population densities on infested mulberry trees averaged over 200 mealybugs/terminal in September 1999 (Figure 1). Corresponding with the broad establishment of *A. kamali*, PHM densities have been consistently low for three consecutive years. *G. indica* is also established in Imperial Valley, however the numbers are typically low during the year, particularly during the warmest months from June through September. In 2002, less than 10 percent of all parasitoids collected during the year were *G. indica*, however, *G. indica* represented 21 percent of the primary parasitoids collected in October. Similar results have been recorded at three study sites consisting of carob trees (Figure 2). PHM densities were high initially, but with the onset of parasitism, population densities have been considerably lower.

Figure 2. Pink Hibiscus Mealybug on Carob Tree
Imperial County, California



Note: # = Sample Size (i.e., no. of sites) * % Parasitism calc only ** % parasitism calc for 1 or no sites

Hyperparasitoid activity against introduced species: The impact of hyperparasitoid species **native** to Imperial Valley on newly introduced primary parasitoid species is being monitored. A hyperparasitic species (*Marietta* sp.) was first collected in July of 2000. At that time, its occurrence was quite rare. Dissected samples confirmed that the primary parasitoid, *A. kamali* is under attack by *Marietta* sp. (Aphelinidae) and, to a lesser extent, by *Chartocerus* sp. (Signiphoridae). *Marietta* sp. was common through the remainder of 2000, as represented by the percent of PHM mummies, from which hyperparasitoids emerged (mean percentage): early August, 11 percent, five sample sites; late August, 51 percent, six sample sites; September, 10 percent, six sample sites; and October, 38 percent, nine sample sites. Hyperparasitoid attack of *A. kamali* has remained approximately the same in 2001 and 2002.

Non-target impact of parasitoids: A number of samples of two resident species of mealybug have been collected over the past two years to monitor for non-target impacts. Ten separate collections of the solenopsis mealybug (*Phenacoccus solenopsis* Tinsley) and 13 collections of the striped mealybug, *Ferrisia virgata* (Cockerell) have been made in Imperial Valley. The former species is native, whereas the later is not a native species. To date, neither *A. kamali* or *G. indica* have been recovered from either mealybug species, thereby demonstrating that they are either moderately or highly host specific.

Area-wide survey: For the third year, an extensive survey was implemented to identify the extent of the PHM infestation in Imperial Valley and to determine if it was present in agricultural crops. In total, 1,863 urban sites and 1,490 agricultural sites were surveyed for PHM infestations. The regional distribution of PHM continues to be limited to the town of Imperial and areas south to Calexico. The PHM distribution has changed remarkably little from the spring of 2000 to the fall of 2002 and has not been found in any commercially grown crops.

The PHM was detected at approximately eight percent of the urban sites (mainly home yards) in Calexico in 2002; similar in value to 10 percent of the sites surveyed in 2001, down from 38 percent in 2000. In contrast, the PHM was detected at approximately 28 percent of the sites

monitored in El Centro, up from nine percent in 2001 and 15 percent in 2000. The percent detection in the remaining communities in 2002 was similar or lower than recorded in previous years. It is noteworthy to point out that PHM density on mulberry trees and other host plants at the El Centro Naval Facility continued to be elevated when compared to most other locations in Imperial Valley. Over 50 percent of the mulberry and hibiscus host plants (more than 100 plants) had detectable populations of PHM. Follow up field samples determined that the population densities were among the highest in Imperial Valley. Furthermore, the native mealybug, *P. solenopsis*, exhibited elevated population densities as well. The combination of these two events strongly suggests that biological control is being disrupted at this location. This may be due to mosquito abatement insecticide application that is common at that site.

Summary for 2002: The two biological control agents released against the PHM have become widely established throughout infested areas of Imperial Valley, and at least one species has had considerable impact to date. Overall regional densities of PHM have decreased markedly since 1999 and its distribution has been unchanged and continues to be restricted to urban locations.

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